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MARKS SYSTEM OF GYPSUM ROOFS

MARKS SYSTEM
— MARKS —
GYPSUM ROOFS

H·E·MARKS CORPORATION
EMPIRE BUILDING, PITTSBURGH, PA.

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Marks System
Gypsum Roofs

MARKS SYSTEM
— MARKS —
GYPSUM ROOFS

Poured-in-Place
Pre-Cast Slabs

Patented Nov. 22, 1921
Other Patents Pending

H. E. MARKS CORPORATION
Empire Building
Pittsburgh, Pa.

CLEVELAND, OHIO
STUYVESANT BUILDING

CHICAGO, ILL.
TACOMA BUILDING

KEYSTONE GYPSUM FIREPROOFING COMPANY
EASTERN REPRESENTATIVES

NEW YORK, N. Y.
MARBRIDGE BUILDING

PHILADELPHIA, PA.
NORTH AMERICAN BUILDING



A typical Marks installation. Note the clean, bright and attractive paneled under-surface.

FOREWORD

GYPSUM ROOFS because of their light weight and insulation value are today generally recognized by the leading industrial engineers and manufacturers as the ideal roof construction. Savings are effected in the original cost of the structure and heating equipment, as well as in the decreased amount of fuel required in the heating of the building. The heating tables shown on page 13 clearly show the higher insulation value of Gypsum as compared with other materials used for roofing purposes.

The Marks System of Gypsum Roofs is the result of years of practical experience in designing and building Gypsum Roofs. The outstanding feature of the Marks System is that it is an improved method of constructing a monolithic, poured-in-place slab, eliminating drip during erection and the necessity of building temporary forms and their supports, in which to contain the aggregate.

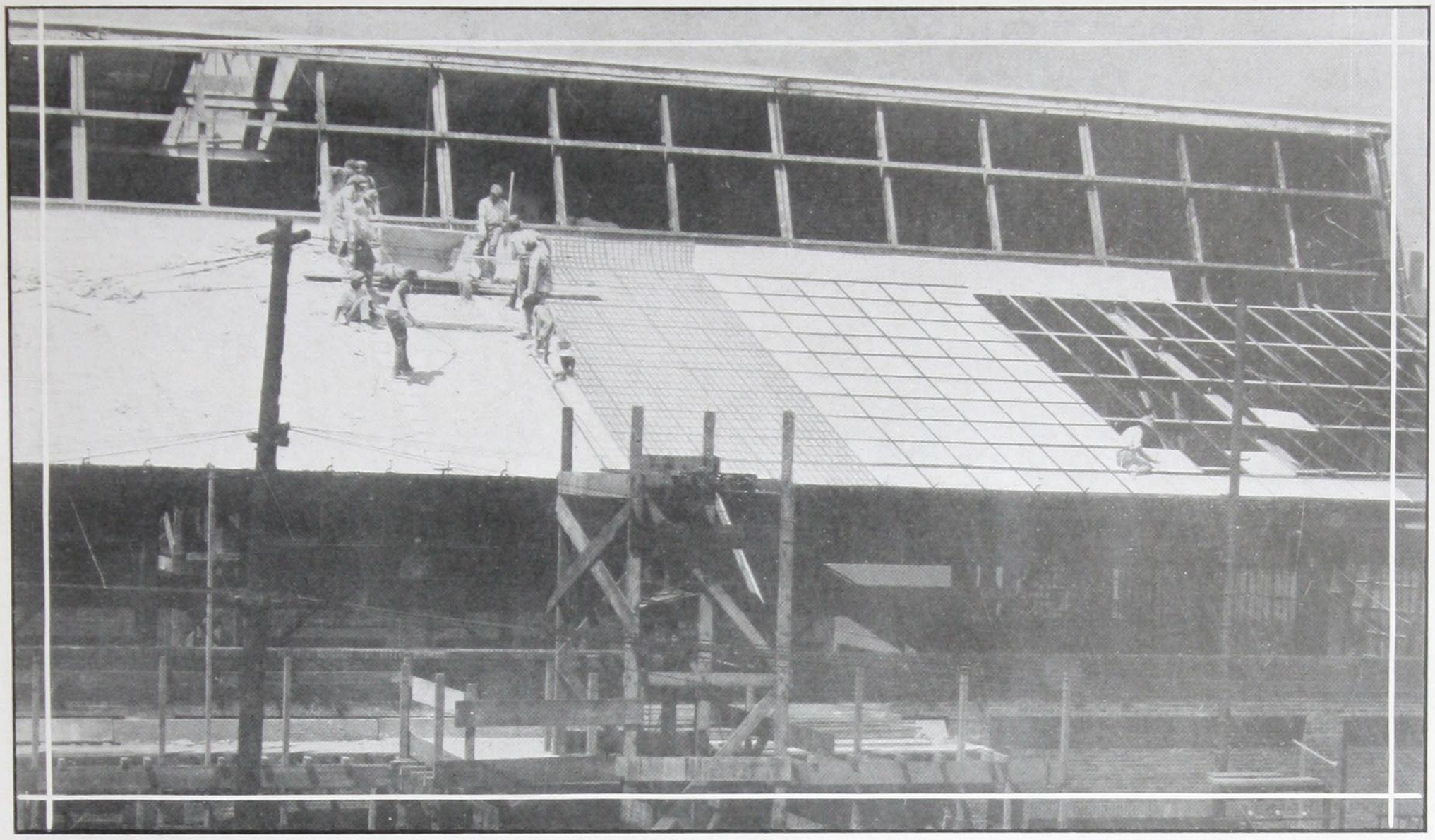
The advantages and economies of this type of construction have been readily recognized by leading engineers, architects and manufacturers and the results have been highly satisfactory. Complete details covering the construction, specifications, etc., are fully described in the following pages.

H. E. MARKS CORPORATION

Marks Poured-in-Place Gypsum Roofs

THE MARKS SYSTEM of Poured-in-Place Gypsum Roofs was designed primarily to eliminate the necessity of erecting temporary wooden forms for roof and floor slabs required in this type of construction. In the Marks System the centering is composed of steel Ts and Gypsum Board, and not only does this material act as a centering, but it remains in the roof construction and eliminates the dripping which is unavoidable in other forms of poured construction. The steel Ts act as an additional load bearing factor and the Gypsum Boards become a part of the total thickness of the roof slab, so that this material while acting as a form temporarily, actually becomes a part of the roof structure.

The Welded Wire Reinforcement—in which the longitudinal members are spaced 4" apart and the cross members 12" apart—is made in rolls of the same width as the space between the longitudinal Ts and is continuous from one side of the roof to the other.



The upper illustration shows a Marks System Roof in process of construction.

The view below is the same work completed.



Construction

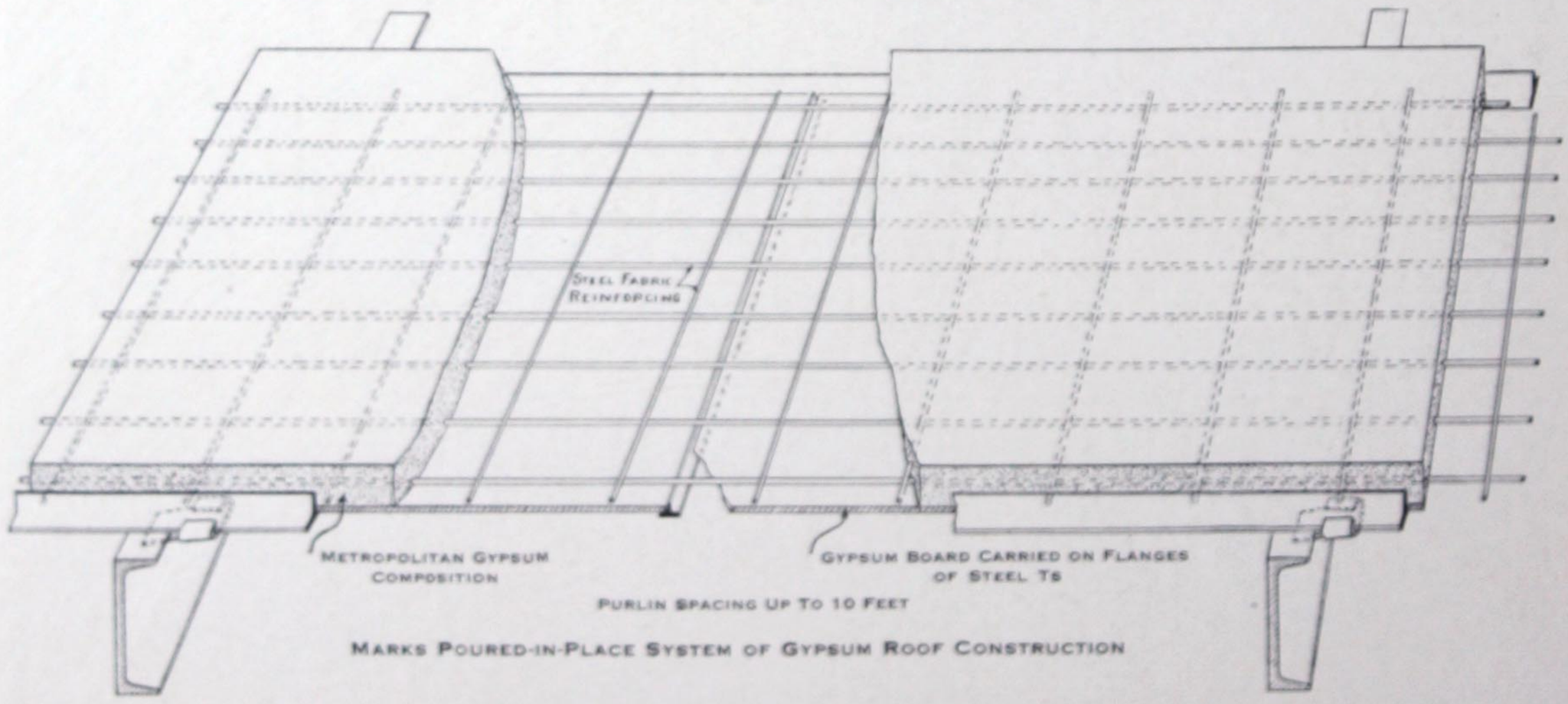
THE MARKS SYSTEM consists of steel Ts supported on roof purlins, Gypsum Board Panels, Galvanized Wire Fabric Reinforcement, and a Poured-in-Place Gypsum or concrete slab.

Two sizes of Ts are used. The large main Ts span from purlin to purlin, spaced 2'8" apart. These Ts are laid in one or more pieces, as the size of the roof requires. They are secured at the eaves, and to one or more of the purlins.

The cross Ts are 2'8" long, and are simply laid (not fastened) in the main Ts, to support the end of the Gypsum Board at three-foot intervals. As the cross Ts are laid, the standard sized 2'8"x3'0" Gypsum Board panels are placed in position, being supported along their four sides by flanges of the cross and main Ts.

After a row of panels has been placed, the Reinforcing Fabric of proper width, and cut to the exact length of the roof, is laid over the cross Ts.

The forms are now ready for the aggregate, which is poured into place, forming, with the Reinforcing Fabric, a solid monolithic reinforced slab, of which the Gypsum Board and Ts become an integral part.

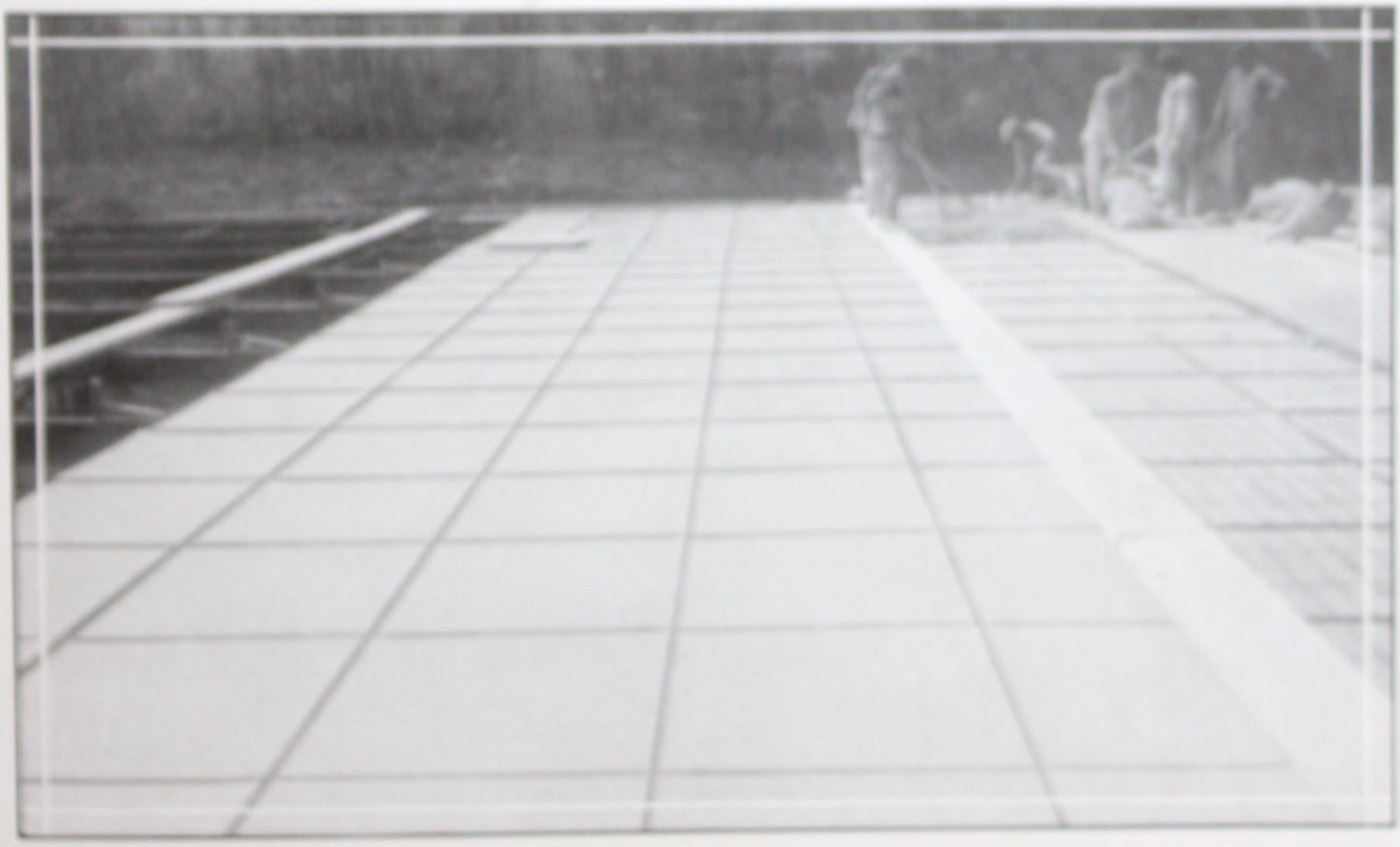


Marks Poured-in-Place System of Gypsum Roof Construction

FIG. 1



In reinforcement work it is of the utmost importance that the wires be properly spaced—the rectangular welded reinforcement employed in the Marks System compels absolutely correct spacing.



Advantages of The Marks System Poured-in-Place Gypsum Construction

The advantages of this construction are many:

¶ Very frequently a considerable sum of money can be saved on account of its light dead load, especially if the Marks engineers are consulted before the steel columns, trusses, etc., have been designed.

¶ The centering is practically tight and the aggregate poured does not drip through the slab, thereby keeping the interior of the building clean. There is, therefore, no inconvenience to any other work going on in the interior of the building. Especially is this a very important factor in re-roofing old buildings where continuous operation is required.

¶ In the Marks construction the underside is perfectly clean. All of the companies for whom the Marks System Roof has been built are very much pleased with the underside finish. It is not only a roof, but a finished ceiling. There is no other roofing on the market which has the attractive appearance of the Marks construction.

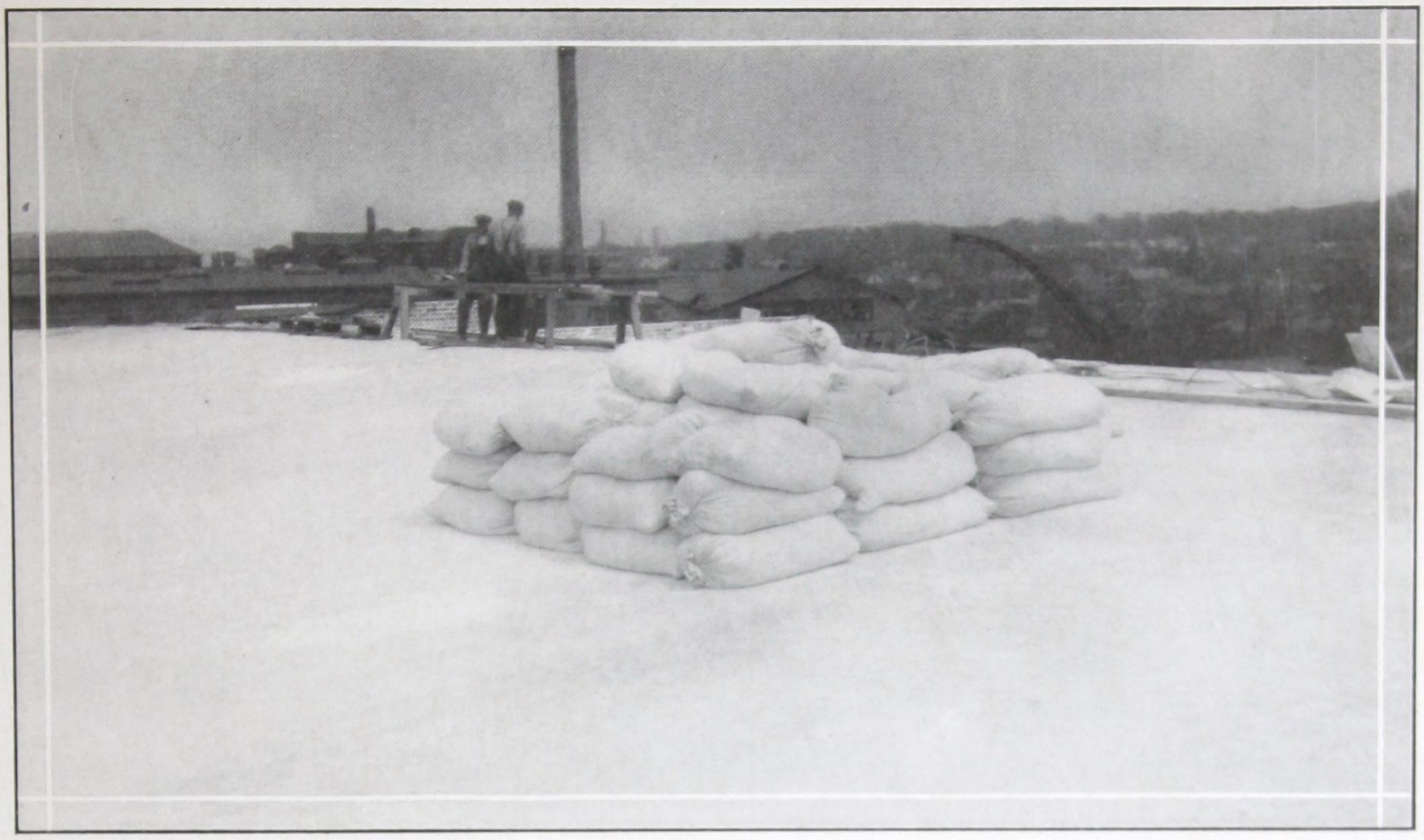
¶ The Gypsum Board finish absolutely prevents all dusting and discoloration of the Gypsum on the underside.

¶ In the Marks construction the Steel Reinforcement—the important factor in the load bearing capacity of the roof—is absolutely protected on the underside by $\frac{3}{8}$" thickness of Gypsum Board.

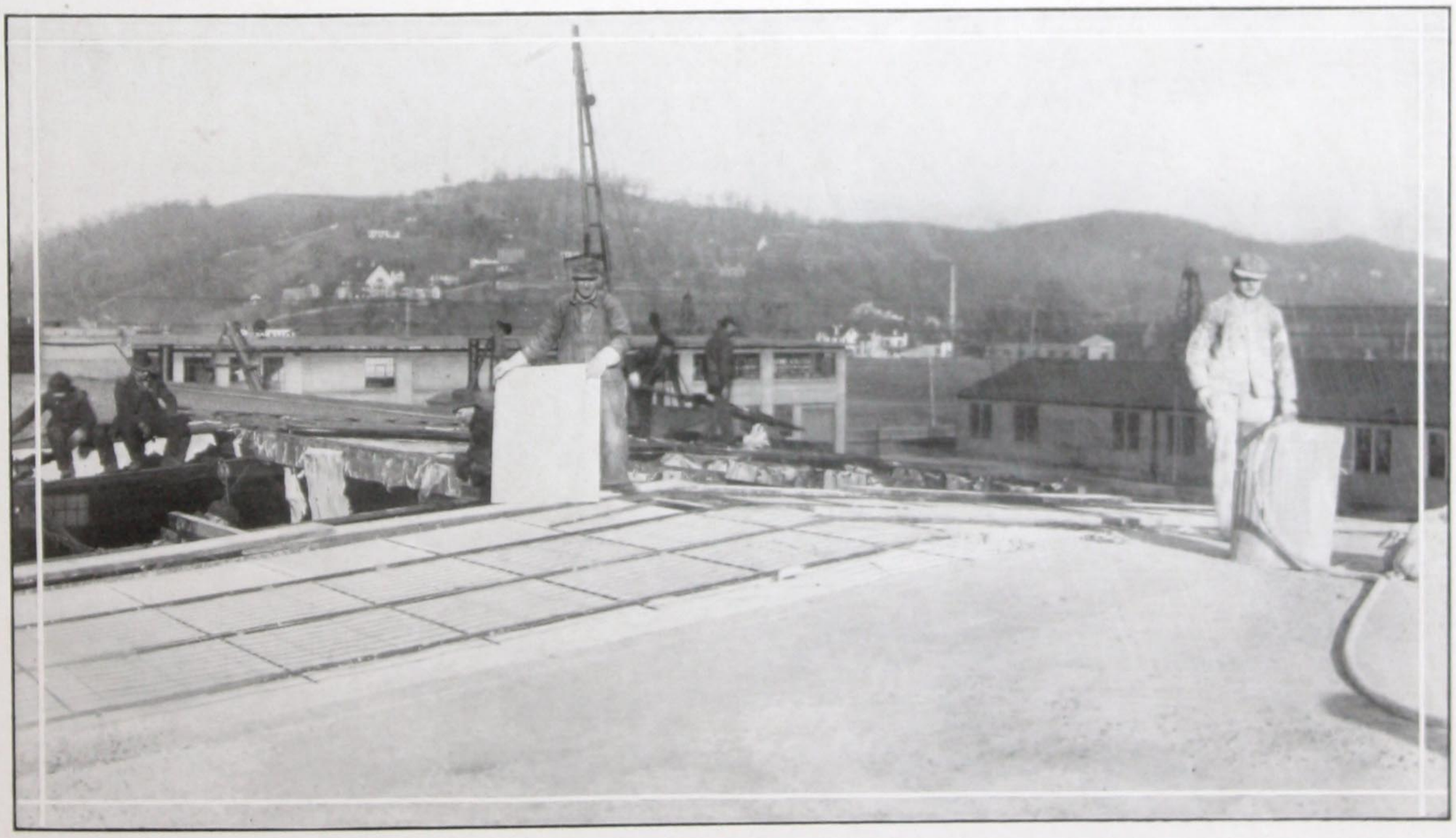
¶ No end bay bracing or tie rods are required with the Marks System.

¶ The combination of structural Ts and Reinforced Gypsum on the Marks System absolutely eliminates the possibility of sag between the purlins. This construction is entirely above the purlins and is adapted to meet any standard design of framework without changes or additions.

¶ The load capacities shown on pages 12 and 13 are based on reinforced slab figures only. An additional factor of safety is obtained in this system by the use of the structural Ts in the permanent form.



Test made during construction Marks Roof—loaded three times the designed figure.



A wood roof deck being replaced by the Marks System without interruption to work in machine shop underneath.

Specifications for Marks System Poured-in-Place Gypsum Roofs

THE roof decks shall be constructed of.....thickness of the Marks System of Reinforced Gypsum in accordance with the details of construction as shown on page 6 of the Manufacturer's Catalog. This work to be installed by the H. E. Marks Corporation, Empire Building, Pittsburgh, Pa.

Specifications for Marks System Pre-Cast Gypsum Slabs

THE roof decks shall be constructed of.....thickness of the Marks System of pre-cast Gypsum slabs in accordance with the details of construction as shown on page 11 of the Manufacturer's Catalog. This slab shall be manufactured and installed by the H. E. Marks Corporation, Empire Building, Pittsburgh, Pa.

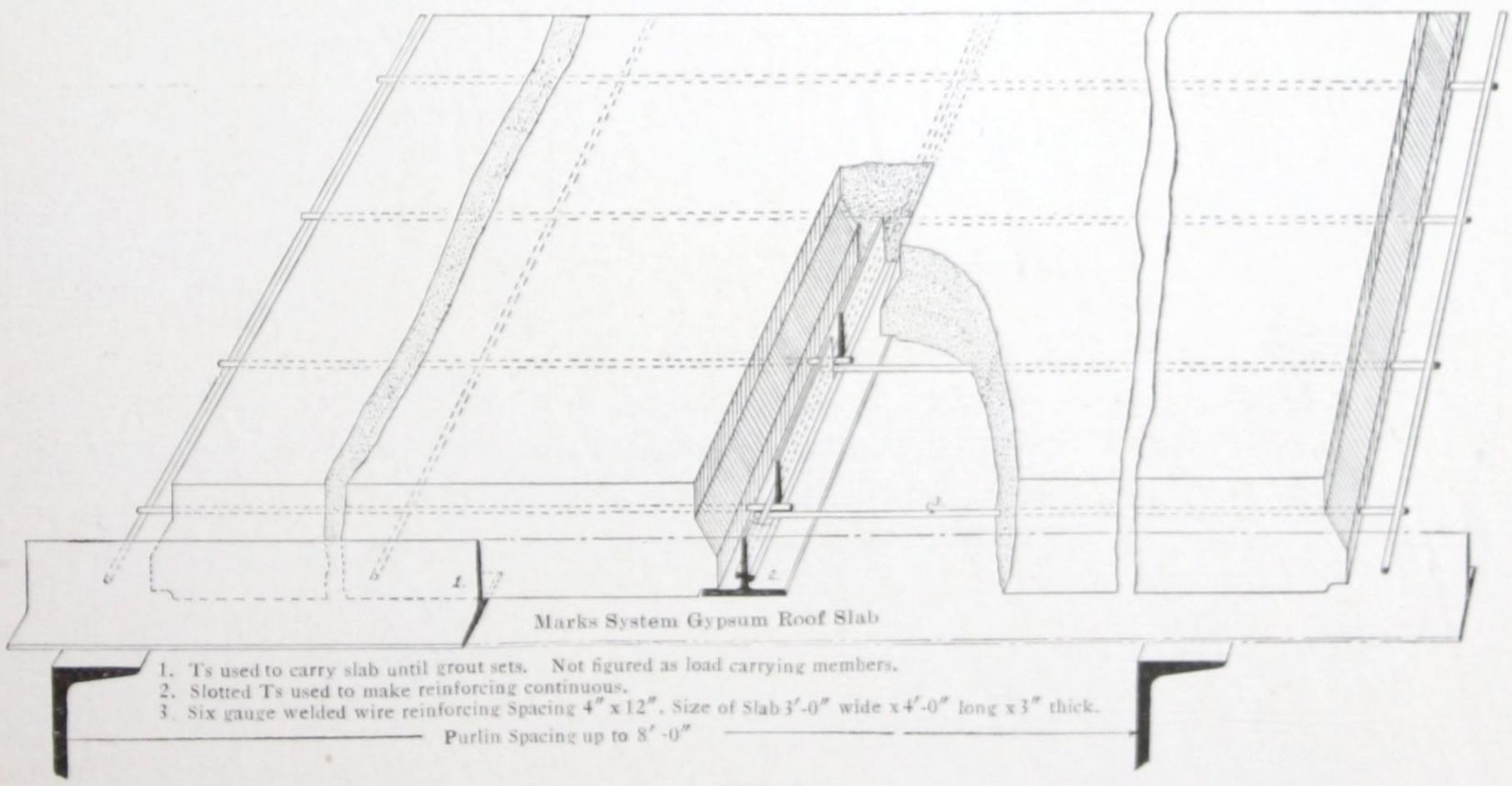
Marks System Pre-Cast Gypsum Slabs

THE use of pre-cast Gypsum slabs for roofing construction is recommended by this company for use on extreme roof pitches where Poured-in-Place Gypsum roofs are not practical.

In the Marks System the pre-cast slabs are properly reinforced by means of welded wires which project at each end of the slab. These wires are automatically tied together by means of a slotted T which lies between the longitudinal Ts at the end of each slab. Figure 2 at the bottom of the page clearly shows the details of this construction.

The same reinforcing strength as well as the clean underside finished appearance of the roof is assured in this type of construction as in the Marks System Poured-in-Place Gypsum Roofs.

Marks System pre-cast slabs are made in one standard size—3'0" wide by 4'0" long and are adaptable to any purlin span up to 8'0".



Marks System Gypsum Roof Slab

1. Ts used to carry slab until grout sets. Not figured as load carrying members.
2. Slotted Ts used to make reinforcing continuous.
3. Six gauge welded wire reinforcing Spacing 4" x 12". Size of Slab 3'-0" wide x 4'-0" long x 3" thick.

Purlin Spacing up to 8'-0"

FIG. 2

Table of Safe Loads
Poured-in-Place Construction

Thickness of Slab in Inches = T	Weight of Slab #/□'	Galvanized Welded Wire Reinforcement				Slab					Span of Slab in Feet (center to center of purlins)												
		Gauge	Diameter in Inches	Spacing in Inches	As	d	k	j	fs	fg	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10
											Safe Superimposed Loads in Pounds per Sq. Ft. (Weight of slab has been deducted)												
2½	11	8	0.1620	4	0.0618	2	0.323	0.892	13,800	220	68	52	40	31	24	...	..	..	..	..	..	..	..
		7					0.347	0.884	12,410	220	73	56	43	34	27	...	..	..	..	..	..	..	..
		6					0.370	0.877	11,240	220	78	60	46	36	29	23	..	..	..	..	..	..	..
		5					0.391	0.870	10,220	220	83	63	49	39	31	24	..	..	..	..	..	..	..
3	13	8	0.1770	4	0.0738	2½	0.295	0.902	15,750	220	101	77	60	48	38	30	24	..	..	..	..	..	..
		7					0.317	0.894	13,370	220	109	83	65	51	41	33	27	..	..	..	..	..	..
		6					0.339	0.887	12,870	220	116	89	70	55	44	36	29	24	..	..	..	..	..
		5					0.360	0.880	11,760	220	123	95	74	59	48	39	31	26	..	..	..	..	..
		4					0.384	0.872	10,600	220	131	101	79	63	51	42	34	28	..	..	..	..	..
3½	15	7	0.1920	4	0.0869	3	0.295	0.902	15,830	220	150	115	90	72	58	47	39	32	26	..	..	..	..
		6					0.315	0.895	14,350	220	...	123	96	77	63	51	42	35	29	24	..	..	..
		5					0.335	0.889	13,130	220	...	131	103	83	67	55	45	37	31	26	..	..	..
		4					0.358	0.881	11,850	220	...	139	110	88	72	59	49	41	34	28	..	..	..
4	17	6	0.2070	4	0.1010	3½	0.296	0.902	15,780	220	...	161	127	102	83	68	56	47	39	33	27	..	..
		5					0.315	0.895	14,410	220	...	...	135	109	89	73	61	51	42	36	30	25	..
		4					0.337	0.888	13,020	220	...	...	144	116	95	78	65	55	46	39	33	28	..
4½	19	5	0.2253	4	0.1196	4	0.298	0.901	15,580	220	...	...	...	137	112	93	77	65	55	46	39	33	28
		4					0.319	0.894	14,090	220	...	...	...	147	120	100	83	70	59	51	43	37	31
		3	0.2437		0.1399		0.340	0.887	12,830	220	...	...	...	157	128	107	89	75	64	55	47	40	34

Size of T Beams	Wt. per Lin. Ft. in Lbs.	*Safe Load in Pounds per Sq. Ft. Uniformly Distributed for Longitudinal T Beams (Weight of T has been deducted)												
$1\frac{1}{2}''$ x $1\frac{1}{2}''$ x $\frac{3}{16}''$	1.94	34	26	21	18	15	12	11	..	..	..	..	..	..
2 " x 2 " x $\frac{1}{4}''$	3.56	...	...	51	42	35	29	25	22	19	..	..	..	..
$2\frac{1}{4}''$ x $2\frac{1}{4}''$ x $\frac{5}{16}''$	4.90	...	...	...	...	...	...	40	35	30	27	24	21	19

*Based on 32 inch centers

Tables based on reinforced concrete beam formulas—

using — n = 30

b = 12"

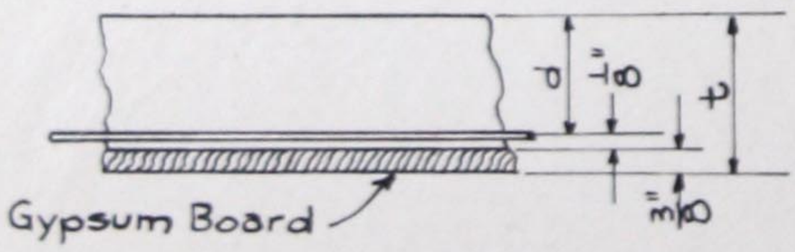
fg = 220 #/□" (Max.)

fs = 16,000 #/□' (Max.)

For $M = \frac{WL^2}{12}$ add 20% to sum of superimposed load and wt. of slab. Then subtract wt. of slab.

For $M = \frac{WL^2}{8}$ subtract 20% from sum of superimposed load and wt. of slab. Then subtract wt. of slab.

$M = \frac{WL^2}{10}$



Total Safe Load = Sum of safe load for slab and safe load for Longitudinal T Beams.

Table Safe Loads
Pre-Cast Slab Construction

Thickness of Slab in inches = T	Wt. of Slab #/□'	Galv. Welded Wire Reinforcement				Slab					Span of Slab in Feet (center to center of purlins)								
		Gauge	Diam. in inches	Spacing in inches	As	d	k	j	fs	fg	4	4½	5	5½	6	6½	7	7½	8
											Safe Superimposed Loads in Pounds per square foot (Weight of slab has been deducted)								
3	13	7	0.1770	4	0.0738	2½	0.317	0.894	13,370	220	109	83	65	51	41	33	27	...	...
3½	15	6	0.1920	4	0.0869	3	0.315	0.895	14,350	220		123	96	77	63	51	42	35	29

Size of T Beam	Wt. per Lin. Ft. in Lbs.	*Safe Load in Pounds per Sq. Ft. Uniformly Distributed for Longitudinal T Beams (Weight of T has been deducted)								
2½" x 1¼" x 3/16"	2.87	24	19	15	12	10	8	7		

*Based on 36 inch centers

Tables based on reinforced concrete beam formulas—

using — n = 30
b = 12"
fg = 220 #/□" (Max.)
fs = 16,000 #/□' (Max.)

$M = \frac{wL^2}{10}$

For $M = \frac{wL^2}{12}$ add 20% to sum of superimposed load and wt. of slab. Then subtract wt. of slab.

For $M = \frac{wL^2}{8}$ subtract 20% from sum of superimposed load and wt. of slab. Then subtract wt. of slab.

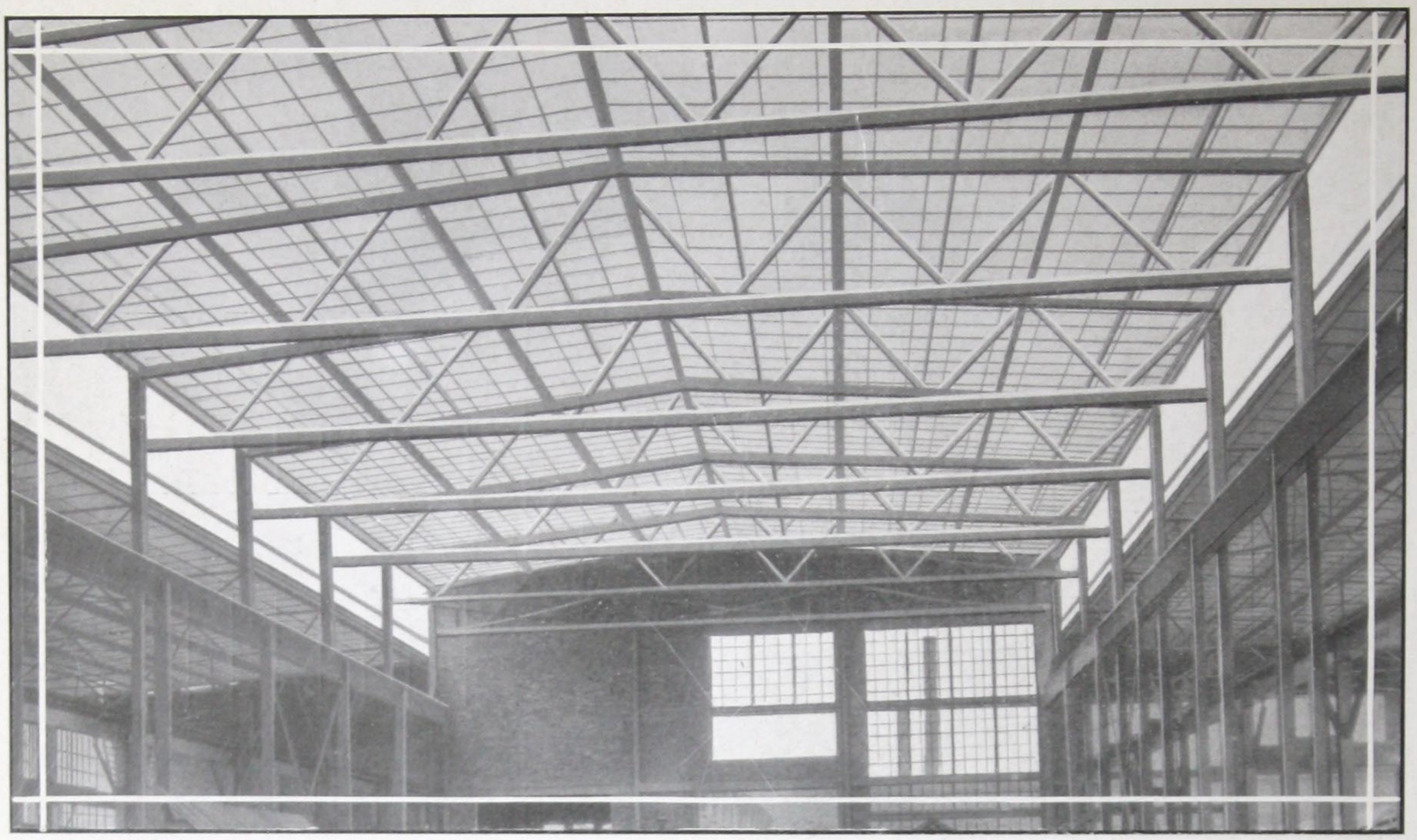
Total Safe Load = Sum of safe load for slab and safe load for Longitudinal T Beams.

Heat Transmission Table

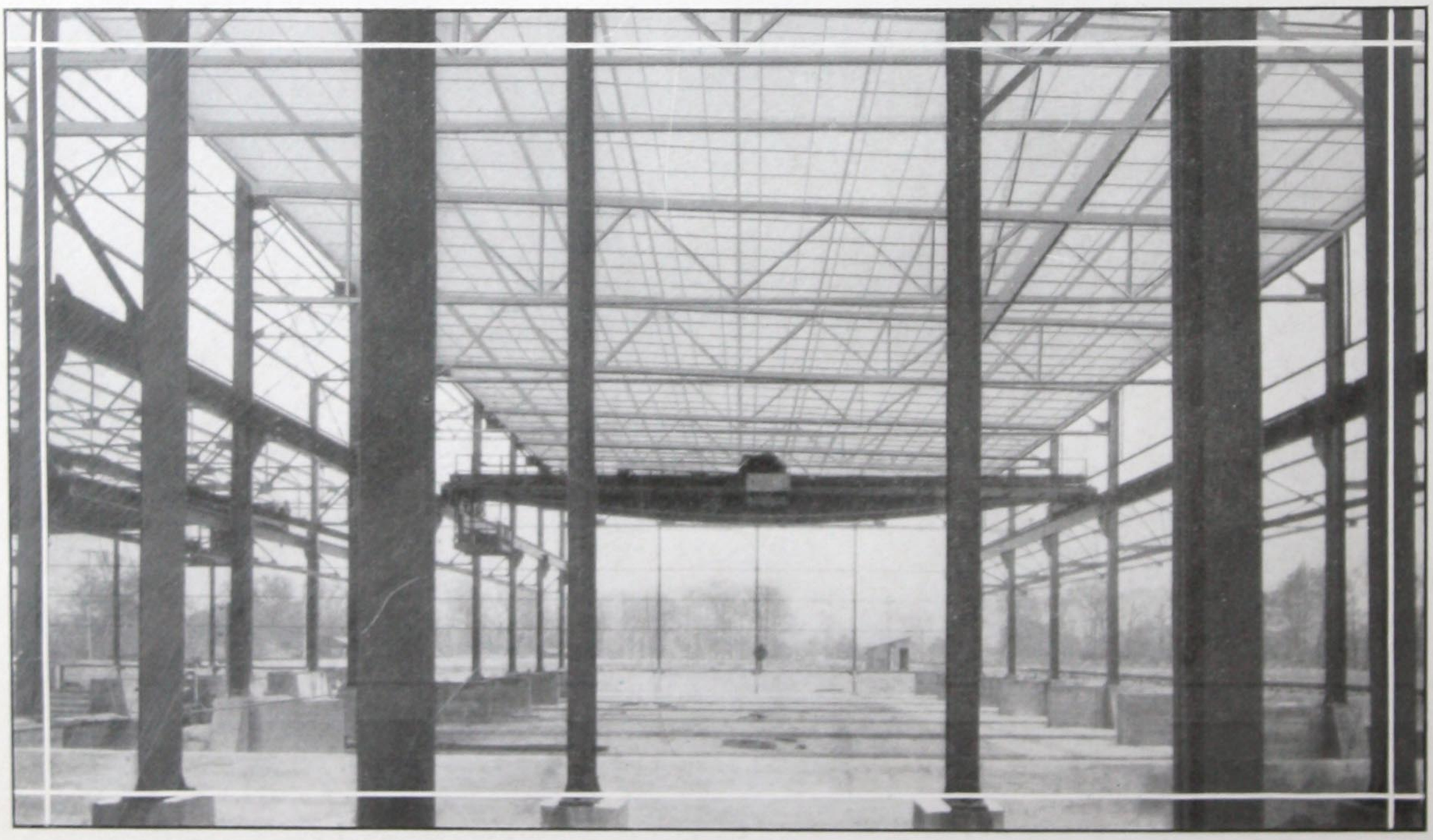
B. T. U. Transmitted for 1° difference in temp. of air inside and out, per 24 hours

Construction

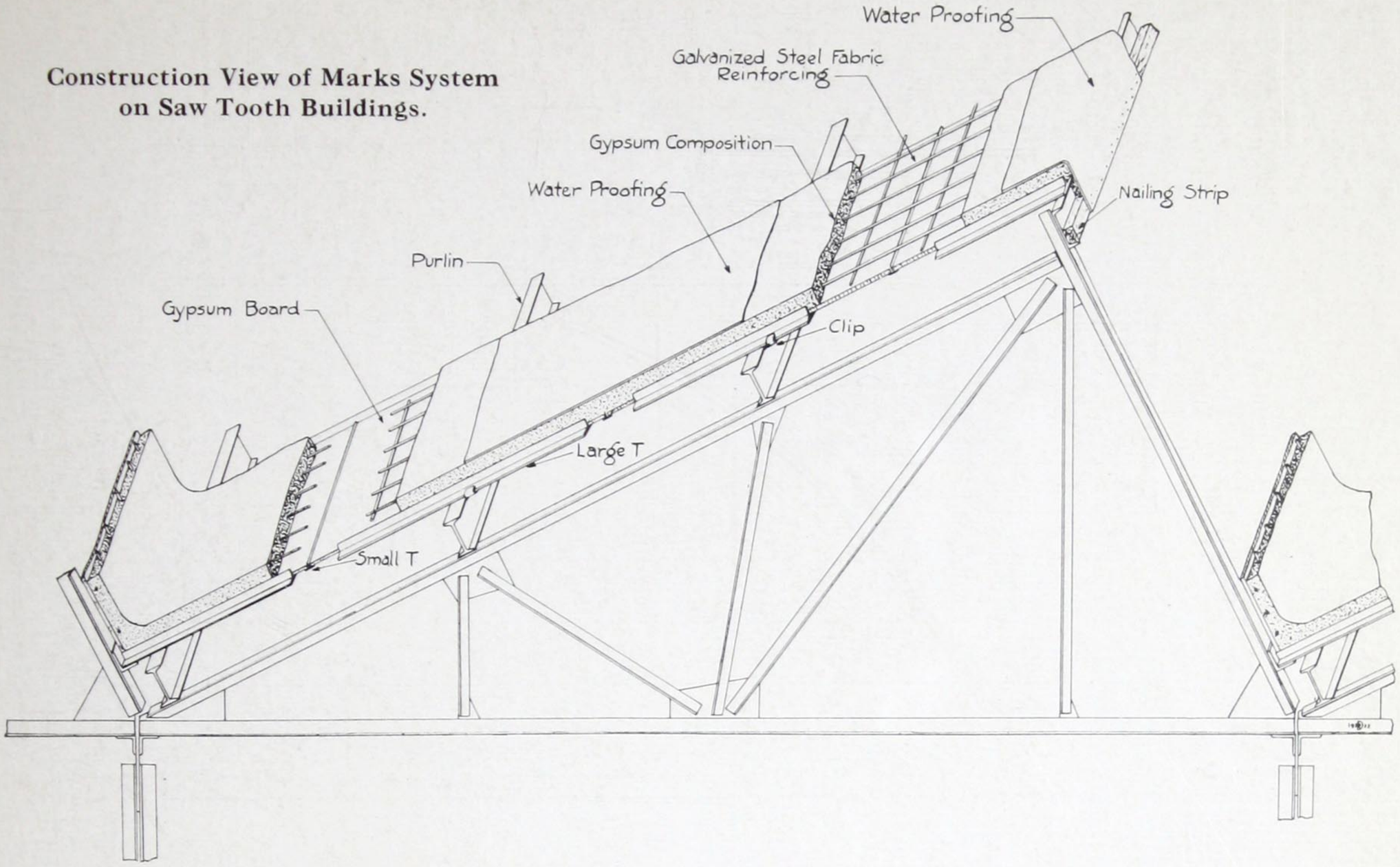
4" Gpysum Slab with 5 ply Tar and Felt	4.08
3½" " " " " " "	4.55
3" " " " " " "	5.14
3" Hollow Terra Cotta Tile with 5 ply Tar and Felt	8.35
6" Stone Concrete " " " " "	11.70
4" Cinder Concrete " " " " "	12.20
4" Stone Concrete " " " " "	13.80
3" Cinder Concrete " " " " "	14.10
3" Stone Concrete " " " " "	15.20
4" Stone Concrete with 1" Cork and 5 ply Tar and Felt	5.08



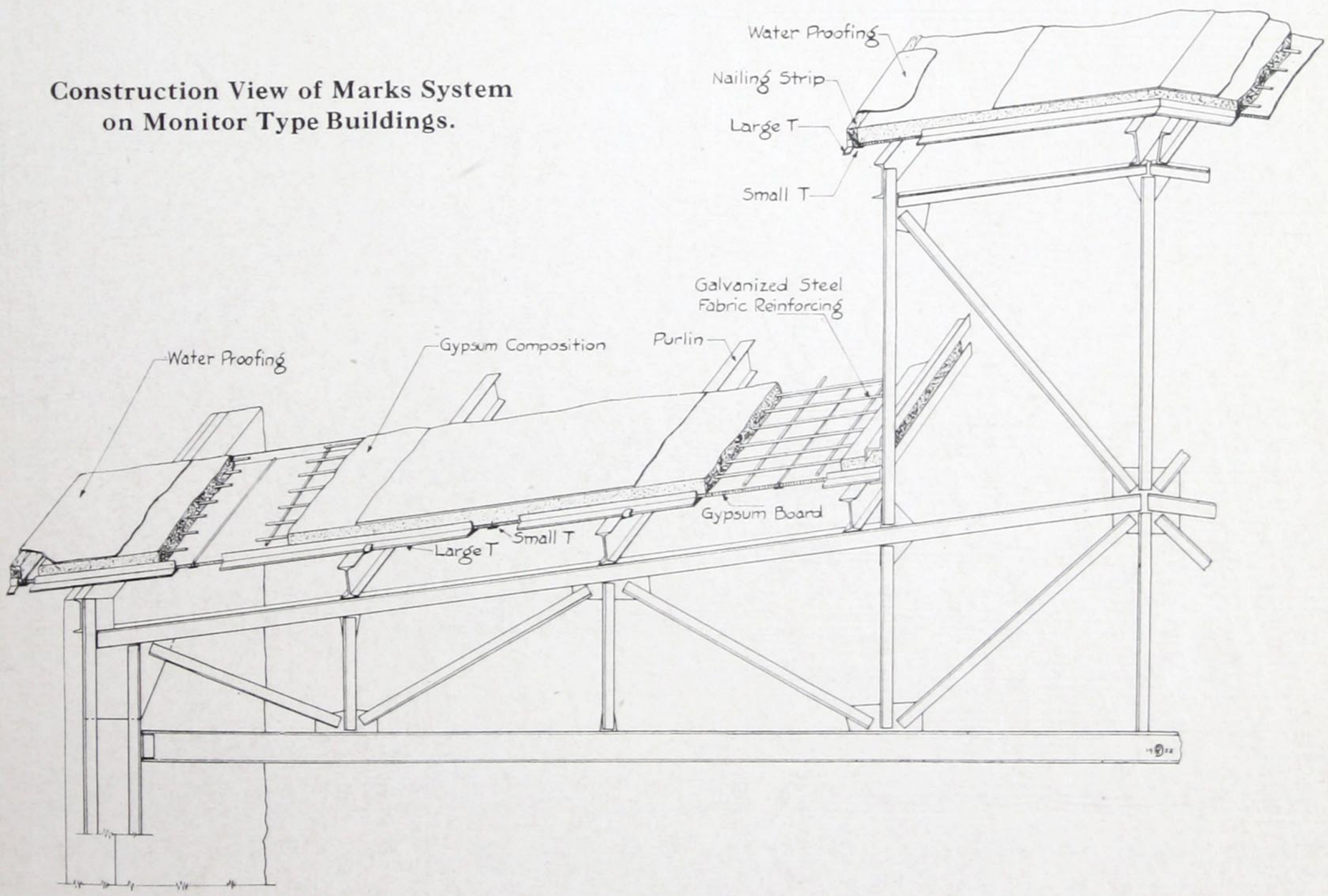
Two installations clearly illustrating the clean underside finish of Marks System Roofs.



Construction View of Marks System on Saw Tooth Buildings.



Construction View of Marks System on Monitor Type Buildings.



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